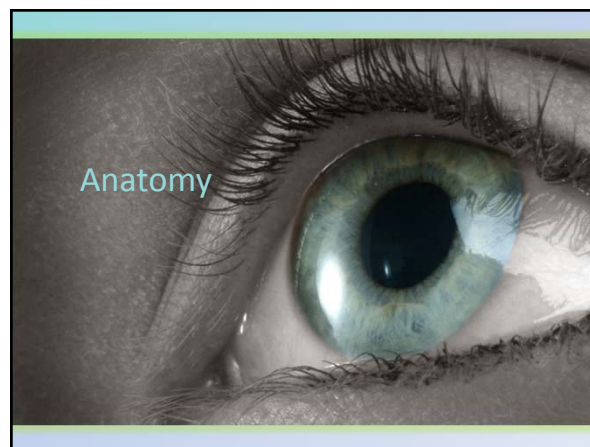


### Disclosure

- Consultant
  - ALCON Vision Care
  - Allergan
  - Novabay
  - Valeant
- President
  - EyePrint Prosthetics
- I have no financial interest in any of the product mentioned in this lecture

### Function

- The eyelids have 2 main functions:
  - Protection of the globe
  - Secretion, distribution and drainage of tears

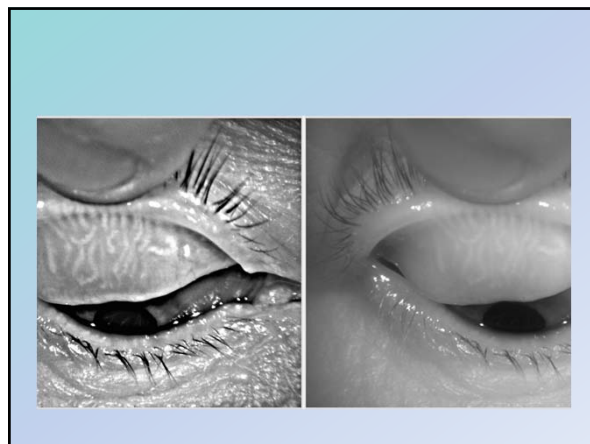
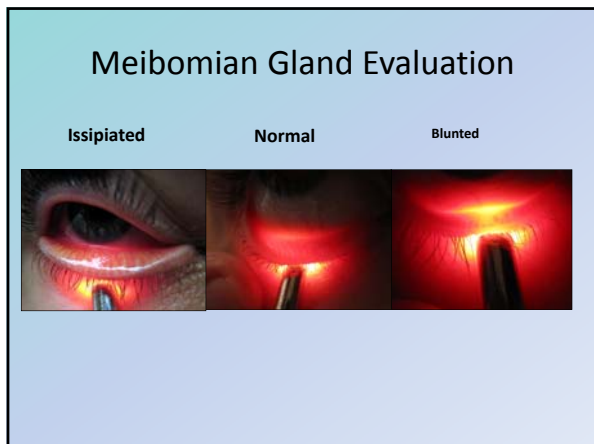


### Eyelid Layers

- The layers of the eyelid are:
  - i) skin
  - ii) loose subcutaneous tissue
  - iii) muscle layer
  - iv) loose connective tissue layer under the muscle
  - v) fibrous tissue layer
  - vi) smooth muscle layer
  - vii) conjunctiva.

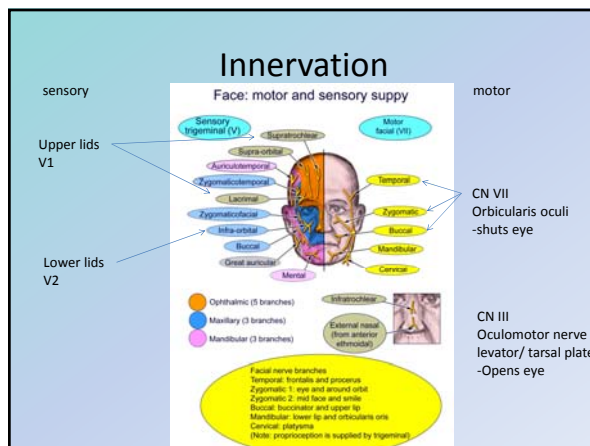
### Glands in the Eyelids

- The glands of the eyelid are:
  - i) **meibomian glands** – in the tarsal plate. Their secretion forms the oily part of the tear film.
  - ii) **glands of Zeis** – sebaceous glands that open into the follicles of the eyelashes.
  - iii) **glands of Moll** – modified sweat glands that also open into the eyelash follicles.
  - iv) **glands of Wolfring** – these are accessory lacrimal or tear glands.




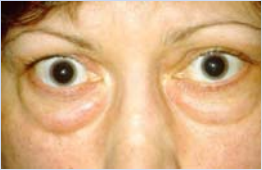
### Innervation

- upper eyelids
  - infratrochlear, supratrochlear, supraorbital and the lacrimal nerves from the ophthalmic branch (V1) of the trigeminal nerve (CN V).
- The skin of the lower eyelid:
  - infratrochlear at the medial angle
  - the rest is supplied by branches of the infraorbital nerve of the maxillary branch (V2) of the trigeminal nerve.




### Position


- When the eye is open the upper lid covers 1/6 of the cornea and the lower lid should just touch the limbus
- Enlarged aperture
  - Thyroid eye disease
  - Space occupying lesion


### Movement- Vertical



### Movement- Horizontal





### Lagophthalmos




### Innervation

- Marcus-Gunn Jaw Winking
- Aberrant connection of the oculomotor nerve (CN III) fibers that innervate the levator and the trigeminal nerve fibers of the muscles of mastication

### Innervation

- 7<sup>th</sup> Nerve Palsy
  - Bell's Palsy
    - Self limiting
    - <1% bilateral
  - DDx
    - brain tumor
    - Stroke
    - myasthenia gravis
    - Lyme disease.
  - Inability to close eye



### Innervation

- Inability to Open Lid
  - Horner's Syndrome
    - Look for small pupil
    - Mild ptosis
    - Impaired innervation of sympathetic to muellers muscle
  - Stroke
  - Aneurysm
  - Tumor

### Innervation

- Inability to open lid
  - 3rd Nerve Palsy
    - dilated, poorly reactive pupil
    - reduced ocular movements
    - ocular misalignment
  - Pupil sparing
    - Ischemic cranial neuropathy (DM, HTN)
  - Pupil affecting
    - Compressive lesion
    - Aneurysm

### Innervation

- Myasthenia gravis
  - 20/100,000 people
  - Reduction is acetylcholine receptor sites
- Common symptoms can include:
  - A drooping eyelid
  - Blurred or double vision
  - Slurred speech
  - Difficulty chewing and swallowing
  - Weakness in the arms and legs
  - Chronic muscle fatigue
  - Difficulty breathing

### Lash Ptosis

- Anatomical changes within the eyelid
  - Orbicularis oculi
  - Riolar muscle
    - Loss of muscle elasticity = loss of follicle support
  - Tarsal plate
    - Deficiency of elastin
- Surgical correction for blepharoptosis

**Lash Ptosis in Congenital and Acquired Blepharoptosis**  
*Arch Ophthalmol.* 2007;125(12):1613-1615

### Position


- Ptosis- Congenital
  - Present at birth
  - Gender: males=females
  - Etiology: levator development abnormal
    - Resulting in fibrosis and fatty infiltration of muscle

### Position

- Ptosis-Congenital
  - Chin up head position is bilateral
  - Nocturnal lagophthalmos
  - Lid crease poorly formed
  - 16% have abnormal superior rectus function as well
  - Amblyopia concern
    - When to do surgery depends on amblyopia risk


### Position

- Ptosis- Acquired
  - Floppy Eye Lid Syndrome
    - GPC
    - Chronic rubbing
  - In obese patients with floppy lids and keratoconus – think Sleep apnea




### Floppy Eyelid Syndrome

- Note the lash ptosis OS



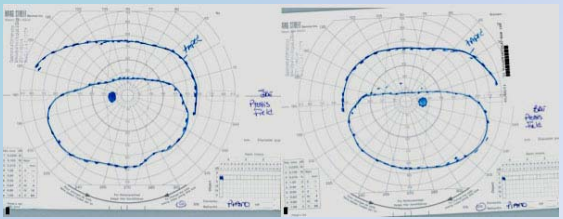
### Ptosis- Acquired

- Levator dehiscence from contact lens wear
- Aging




### Ptosis VF Testing

At least 20 degrees of VF loss for Medicare payment for repair



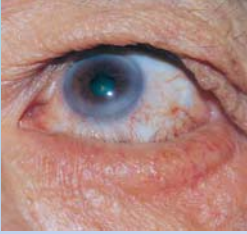
### Ptosis- Acquired

- Neoplastic
- Neurofibromas
- Cicatricial



### Position

#### Entropion

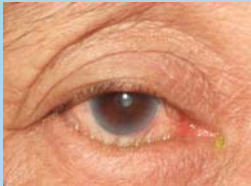


#### Symptoms

- Redness and pain around the eye
- Sensitivity to light and wind
- Sagging skin around the eye
- Epiphora
- Decreased vision, especially if the cornea is damaged

## Position

**Entropion**

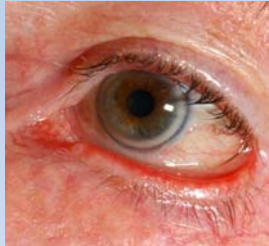


**Causes**

- Congenital
- Aging creating loose skin and stretched and loose ligaments and muscles.
- Scarring
  - Trauma
  - Trachoma
- Spasm
  - Have patients squeeze lids

## Position

**Ectropion**

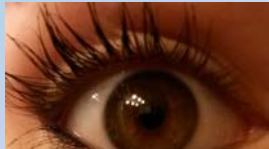



- Muscle weakness.
  - age
  - eyelid can begin to droop and turn outward.
- Facial paralysis.
  - Bell's Palsy
  - tumors
- Scars
  - facial burns
  - Trauma- dog bite or lacerations
- Eyelid growths
  - Benign or cancerous
- Blepharoplasty
- Radiation
  - For neoplasm
  - cosmetic laser skin resurfacing
- Congenital ectropion
  - Down syndrome.
- Steven- Johnson Syndrome

## Disorders Of the Lashes




## Congenital Distichiasis

- Growth of lashes in meibomian glands
  - epithelial germ cells failure to differentiate completely to meibomian glands
- Congenital
  - dominantly inherited with complete penetrance
  - isolated or associated with ptosis, strabismus, congenital heart defect
- Acquired
  - Lower lid
  - Pigmented or non-pigmented
  - Chronic inflammation


## Madarosis

- Decrease or loss of lashes
- Long standing Anterior Blepharitis
- Tumor
- Thermal burns
- Trichotillomania



## Madarosis

- Associated Disease
  - Alopecia
    - Hereditary
    - autoimmune
  - Atopic dermatitis
    - Scratching/ rubbing
  - Systemic Lupus
    - Early loss
    - Breakage
    - Scarred follicles
  - Ichthyosis



## Hypertrichosis

- Excess lashes or abnormally long lashes
  - Congenital
  - Drug induced
    - latanoprost



## Poliosis

- Premature whitening of the hair, lashes and eyebrows
  - Vitiligo
    - Iris heterochromia
    - White forelock
  - Demodex



## Normal Flora

- Staphylococcus epidermidis (95.8%)\*
- Propionibacterium acnes (92.8%)\*
- Corynebacterium sp. (76.8%)\*
- Acinetobacter sp. (11.4%)
- Staphylococcus aureus (10.5%)

\* More heavily colonized in people with blepharitis

- POST-SURGICAL ENDOPTHALMITIS DUE TO
  - Normal Bacterial Flora
  - MOST COMMON IS COAGULASE ( MOST COMMON IS COAGULASE (-) STAPHYLOCOCCUS
  - INCIDENCE ~ 1 PER 750 SURGERIES
  - Increased 2.5 to 6x for Clear Corneal Cataract Extractions
- BABY SHAMPOO NOT ANTIBACTERIAL 10:1 dilution
  - Harsh on tender eyelid skin
- ANTIBACTERIAL SOAPS CONTAIN BAK or EtOH
  - Not good for use around the eye

## Infection

- Staphylococcal blepharitis




### Infection

- Posterior Blepharitis
  - Meibomian Gland Dysfunction




### Infection

- Angular Blepharitis



### Infection


- Hordeolum/Chalazion
  - Demodicosis more prevalent than in control group (69.2% vs 20.3%)
  - D Brevis more common than D Folliculorum (2.82:1)
  - 33% recurrence



Am J Ophthalmol. 2014 Feb;157(2):342-348

### Infection

- Molluscum Contagiosum
- Age: children/ young adults
- Etiology: viral lesions
  - Contact with others
- Single or multiple
- Pearly white with central keratin plug
- Follicular conjunctivitis
- Regress spontaneously/frozen



demodex heebie  
jeebies

### What is Demodex?

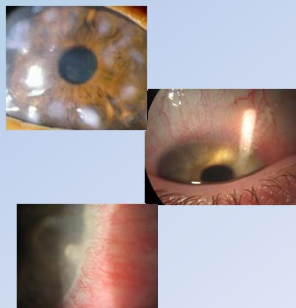
- 8 legged mite which lives in hair follicles and oil glands.
- 65+ species of Demodex,
  - only 2 live on humans (folliculorum and brevis)
  - not the same mites which affect pets.
- spread either through direct contact or in dust and towels containing eggs.
- eat skin cells, hormones and oils in the follicles and glands
- Major cause, if not the cause, of rosacea, seborrheic dermatitis and other skin conditions.





## Associated with other ocular disease states

- Salzmann nodular degeneration
- Ocular rosacea
  - Stem cell failure
- Peripheral ulcers
  - Aka clpu, staph marginal keratitis



## Symptoms

1. Dryness
2. Blurred vision
3. Itching
4. FBS/ irritation
5. Glare
6. Crusting, redness
7. Many people have lived with their Demodex symptoms for so long that they consider them normal.

## Past History

- Patients may have a history of trying treatments with little to no success
- Drop out of contact lens wear
- Past treatments may include:
  - Artificial tears
  - Cyclosporine
  - Antihistamines
  - Doxycycline/ tetracycline
    - Oral
    - Topical
  - Lid hygiene (baby shampoo)
  - Steroids – increases mite counts

## How do mites cause symptoms

- Demodex is colonized with bacteria
- Decaying mite bodies elicit inflammation
- Increasing mite counts
- Immune response to mites
- IL-17 tear concentrations higher in demodex colonized patient than non-colonized patients
  - IL-17 causes inflammation of ocular surface and lid margins

## Looking for Mites



## Challenges

- Demodex associated with CL drop out/ dry eye
  - May be a major cause!
  - I have successfully treated Demodex and patient regained CL wear
- Confused with seasonal allergy
  - Pt self treating allergy
- Need better treatment/ awareness
  - Cliradex
  - Long time course for improvement- months
  - Need quality patient instructions
- No procedure codes for in office diagnosis o treatment
- Need more studies

## Treatment

- Nearly impossible to eradicate
- All members of household should be checked
- Heat kills mites in bedding
- Scrubbing off debris (baby shampoo very bad) helps
- Tea tree oil?
- Manuka honey?
- Colloidal silver?
- Other Essential oils?
- Hypochlorous acid?
- High patient compliance once they see their own mites

## Treatment

- Ivermectin
  - Antiparasitic
  - Paralyzes and kills parasites
  - Oral
    - Single dose 3mg tabs
    - Based on weight
    - Call pharmacist
  - Topical
    - 1% ivermectin
    - Hard to find for humans.
    - OTC for pets (1.87%)



## Treatment skin- not eyes

- Permethrin cream 5%
  - BID
  - More effective than the 0.75% metroidazole
  - No eye indication
- Eurax cream (crotamiton) 10%

## EyeLid Hygiene

- Reasons not to use baby shampoo
  - Dermatitis
    - [JAMA Ophthalmol.](#) 2014 Mar;132(3):357-9
  - Excessive drying
  - Burning
  - Damage lipid layer
    - [Clin Ophthalmol.](#) 2012; 6: 1689–1698.
  - Does not effect bacterial colinization of eyelids
    - [Can J Ophthalmol.](#) 2010;45(6):637–641
  - Dermatologists won't use it on their babies!

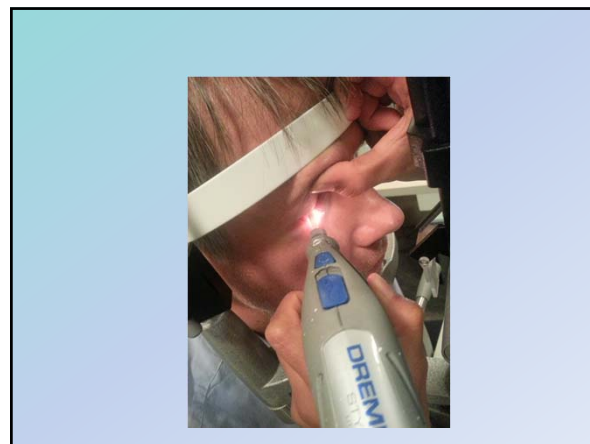
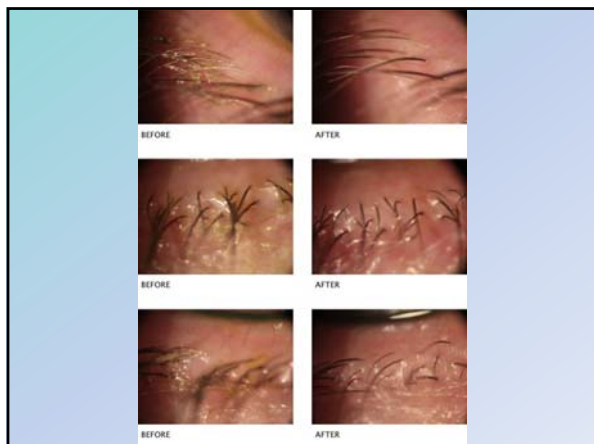
## Hot Compresses

- Warm compresses applied to the outer lid must maintain a temp of 113°F in order to reach the MG, 4-6 minutes.
- Cornea temperature increases
  - [Cornea.](#) 2013 Jul;32(7):e146-9
- Moisture help soften collarettes
- Hot water increases evaporation off periorbital skin
  - Increased drying and discomfort

## BlephEx™



- Last 6-8 minutes
- Repeated every 4-6 months
- Cost \$130- \$250
- \$9986 (not medically necessary- pt aware)



### Current Lid & Lash Cleansers

- Main function is to act as a “detergent”, removing debris from the lids and lashes
- Current formulations contain many, extraneous ingredients
  - Such as surfactants, buffers and wetting agents

### Sterilid

- Linalool
- A Liquid distilled
  - from oils of flowers, spice plants, tea trees.
  - pleasant floral scent and anti-microbial.
- Effective against Pseudomonas




**Only Sterilid kills the bugs in 60 seconds**  
 • Bactericidal • Dry eye • Pre-surgical antibiotic

Microorganism	10 min	30 min	60 min	120 min	240 min
Pseudomonas	X	X	X	X	X
Staphylococcus	X	X	X	X	X
MRSA	X	X	X	X	X
Staph aureus	X	X	X	X	X
Staphylococcus epidermidis	X	X	X	X	X
Staph epidermidis	X	X	X	X	X
Moraxella	X	X	X	X	X

### Ocusoft

- OCuSOFT Lid Scrub  
Original is recommended for routine daily eyelid hygiene
- OCuSOFT Lid Scrub PLUS is an extra strength, leave-on formula recommended for moderate to severe conditions with bacterial involvement.



### Cleansing Oils

- Reduce surfactant induced skin irritation
  - Polar oils bond with proteins and protect skin
  - Sunflower oil better than mineral oil
- [Int J Cosmet Sci](#), 2015 Feb 6.
- Coconut oil has higher saponification
- Improved epidermal barrier loss and cutaneous inflammation
  - [Int J Dermatol](#), 2014 Jan;53(1):100-8

Common Oil (CFA name)	Polarity index (pIWI)
Non polar	
Isoparaffin (C12-C14)	53.9
Scalation	48.2
Isobornane (ARLAKOL NG)	43.9
Mineral Oil (paraffin petroleum)	43.7
Mineral Oil (paraffin naphthenic)	38.3
Flour	
Cyclopentasiloxane	26.6
Dodecyltrimethylsiloxane (D3)	26.4
Isopropylsiloxane	25.2
Cyclohexasiloxane	24.8
Dodecyltrimethylsiloxane (D12)	24.3
Isopropylmyristate	24.2
Cyclopentasiloxane (2-ethylhexyltrimethylsiloxane)	23.1
Neopentylglycol	22.7
Isopropylthiolate	21.9
Capryl/Capene acid Hydroxyethyl (healix oil)	21.3
Isopropylthiolate	21.2
Isopropylthiolate	20.8
Cyclohexane (ARLAKOL D4)	20.6
Phenyl oil	20.5
Hexyl oil	20.3
Sunflower oil	19.3
Dodecylate	18.7
Tricetyl oil	18.3
Olive oil	18.3
Castor oil	13.7
Camellia Oil	11.1
Wheat germ oil	8.3

### Coconut oil

- Coconut oil is a polar oil
  - [J Cosmet Sci](#). 2001 May-Jun;52(3):169-84
- Antibacterial
  - Changes bacterial cell membrane activity
  - [J Med Food](#). 2013 Dec;16(12):1079-85
- Anti- candida
  - [J Med Food](#). 2007 Jun;10(2):384-7
- Lowers lipid peroxide levels
- Antioxidant
  - [Skin Pharmacol Physiol](#). 2010;23(6):290-7

### Coconut oil

- Clinically: what I have found
- Adds oil to the tear film
  - Severe evap dry eye patients report improved comfort while using it
- No need to hot soaks to remove scurf
- Reduced collarettes
- Reduced lid inflammation
- Better long term compliance

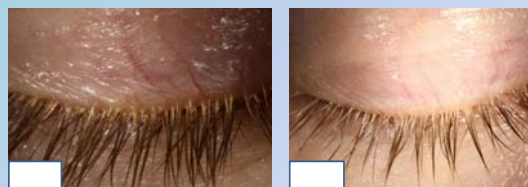
### Coconut oil regime

- Apply small amount to lid margin
- Let soak in about 20 minute
  - Brush teeth
  - Get in jammies
  - Etc...
- Wipe off with dry wash cloth or gauze pad
  - Apply firm but not excessive pressure
- If patient complains of lingering blurred vision: used too much

### Coconut oil scrubs

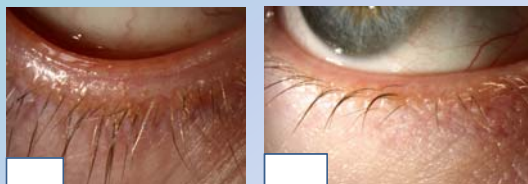
Before

After 1 month of treatment



Before

After 1 month of treatment



### Tea Tree Oil

- Tea tree treatments with 50% lid scrubs in office
- 5-15% TTO at home
- Multiple Properties
  - Anti-microbial
  - Anti-inflammatory
  - Anti-Protozoal
  - Anti-viral
- Toxic to the Ocular surface!




### Cliradex

- Melaleuca alternifolia
  - a special variety of tea tree oil
- Preservative free



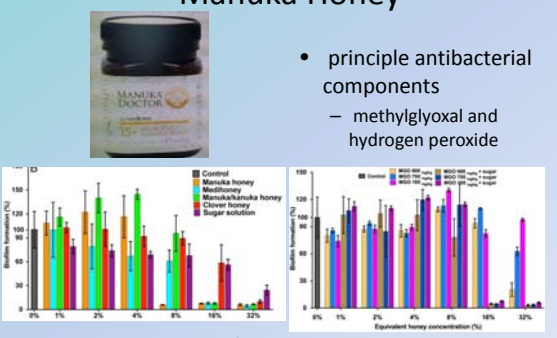
### Manuka honey

- Made in New Zealand by bees that pollinate the native manuka bush.
- UMF (Unique Manuka Factor) determines antibiotic effectiveness.
- Manuka honey used is pharmaceutical/medical grade and highly sterilized.



### Manuka Honey


- principle antibacterial components
  - methylglyoxal and hydrogen peroxide



Manuka-type honeys can eradicate biofilms produced by *Staphylococcus aureus* strains with diff PeerJ. 2014 Mar 25;2

### Betadine

- Betadine 5% Ophthalmic Prep Solution
  - Povidone-Iodine
- Normal surgical scrub is 10%
- Intended for:
  - Irrigation of cornea, conj.
  - Periocular antiseptic
- Wide range of bacteria
  - Effective against biofilm
  - Inhibits release of exotoxins
- Possible Treatment for EKC



### Hypochlorous Acid .01%

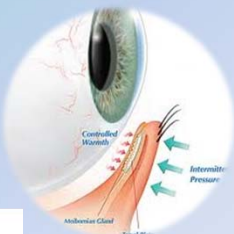

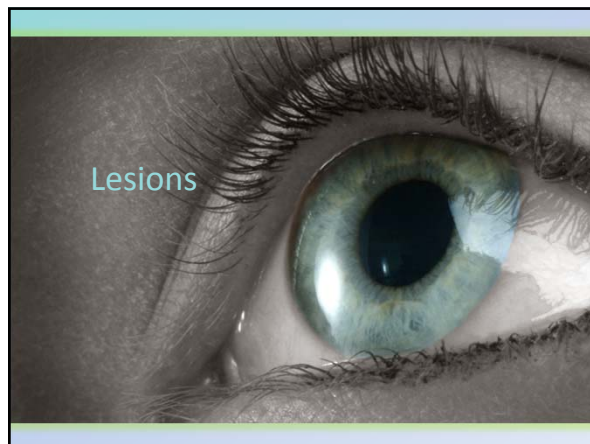
EFFECTIVENESS OF I-LID CLEANSER AGAINST ORGANISMS TESTED IN SOLUTION:

Organism (ATCC number)	Time to Kill	% Reduction
<i>Aspergillus brasiliensis</i> 16404	60 seconds	>99.99%
<i>Bacteroides fragilis</i> 25285	60 seconds	>99.999%
<i>Candida albicans</i> 10231	60 seconds	>99.99%
<i>Clostridium perfringens</i> 13124	60 seconds	>99.99%
<i>Corynebacterium amycolatum</i> 49368	60 seconds	>99.99%
<i>Enterobacter aerogenes</i> 51697	60 seconds	>99.999%
Vancomycin-resistant <i>Enterococcus faecium</i> (VREF) 51559	60 seconds	>99.99%
<i>Haemophilus influenzae</i> 49144	60 seconds	>99.999%
<i>Klebsiella pneumoniae</i> 10031	60 seconds	>99.999%
<i>Proteus mirabilis</i> 14153	60 seconds	>99.999%
<i>Pseudomonas aeruginosa</i> 27853	60 seconds	>99.9999%
<i>Serratia marcescens</i> 14756	60 seconds	>99.999%
Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA) 33591	60 seconds	>99.999%
<i>Staphylococcus aureus</i> 29213	60 seconds	>99.999%
<i>Staphylococcus epidermidis</i> 12228	60 seconds	>99.999%
<i>Staphylococcus haemolyticus</i> 29870	60 seconds	>99.99%
<i>Staphylococcus hominis</i> 27844	60 seconds	>99.99%
<i>Staphylococcus saprophyticus</i> 35562	60 seconds	>99.99%
<i>Streptococcus pyogenes</i> 49389	60 seconds	>99.99%
<i>Vibrio vulnificus</i> 27562	60 seconds	>99.999%

\*Data on file


### Lipiflow/Tearscience

- "A revolutionary way to treat evaporative dry eye caused by meibomian gland dysfunction."
- Controlled heat and massage for optimized stimulation of the meibomian glands.


### Papilloma

- Age: middle age/ elderly
- Etiology
  - Viral: HPV
  - Non-viral: UV light
- Skin:
  - Soft
  - Skin colored, tan or brown
  - Round oval or pedunculated
  - Treatment: excision
- Conjunctival
  - Differential from Squamous cell Carcinoma
  - Treatment: Steroid, 40% recur




### Actinic Keratosis

- Age: rare under 30
- Etiology
  - Presumed sun exposer
  - Generally multiple
  - Most common on face, trunk and upper extremities
- 20% risk of progression to squamous cell carcinoma
- Lesion start flat, light tan
  - Become pigmented, elevated and warty over time
- Treatment
  - Biopsy/excision/ cautery




### Epidermal Inclusion Cysts

- Age: Any
- Males= females
- Smooth round elevated cysts filled with keratin
- Arising from follicles
- Ablation of entire cyst walls necessary for eradication




### Sebaceous Cyst

- Clinically look like epidermal inclusion cysts
- Blocked glands of Zeiss, meibomian or sebaceous
- Filled with epithelial cells, keratin, fat and cholesterol crystals
- Surgical excision




### Eyelid Nevus

- Acquired
  - Begins in childhood
    - Basal epithelium migrates to the dermis surface
  - Deeply pigmented to amelanotic
  - Flat or pedunculated
  - No lash loss
  - 5% malignant transformation
  - Photodocument




### Tumor

- Sebaceous Cell
  - Arise from glands of Zeis
- 2-7% of malignant eyelid tumors
- Diagnosis
  - Recurrent chalazion
  - Chronic meibomitis
  - Blepharconjunctivitis
- Aggressive
  - Orbital extension (17%)
  - Systemic mets (8%)



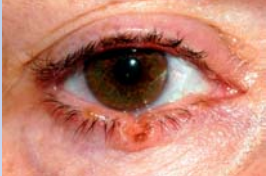
### Sebaceous Cell Carcinoma

- Clinical Features
  - Solitary lid lesion
  - Diffuse lid thickening
  - Loss of lashes
  - Lesion visible through tarsal conjunctiva
- Zeis gland- lid margin
- MG- deep in tarsus




### Tumor

- Basal Cell
  - Most common tumor of the skin
    - Sunlight exposure
    - demodex
  - >400,000 people treated annually in US
  - 65% lower lid
  - 15% medial canthus
  - 15% upper lid
  - 5% lateral canthus




### Basal Cell

- Pearly, waxy, translucent
  - Rolled boarder
- Telangiectasia near borders
- Loss of lashes
- Tumor extensions possible but no distant mets
- Mortality <1%



### Tumor

- Primary Malignant Melanoma
  - Sun exposed areas
  - Primary lesion or met
  - 1% of malignant eyelid tumors
  - Variable pigment mass
    - Can bleed or ulcerate
    - Check fornices
  - Histopath proven
  - Prognosis depends on mets





Benign conj nevus

Malignant melanoma




### Differential Dx



Both patients shown above presented with unilateral, pigmented lesions of the upper eyelid. The patient on the left noticed the lesion slowly progressing over the last 4-5 months; the patient on the right was referred by her primary care physician due to her "suspicious bruise".

### Differential Dx



1. What common historical element might be anticipated in both of these patients?
  - a. Injections of BOTOX™ for cosmetic enhancement
  - b. Atopic dermatitis with eczema
  - c. Chronic or excessive exposure to ultraviolet radiation
  - d. Elevated serum cholesterol and lipids

### Differential Dx

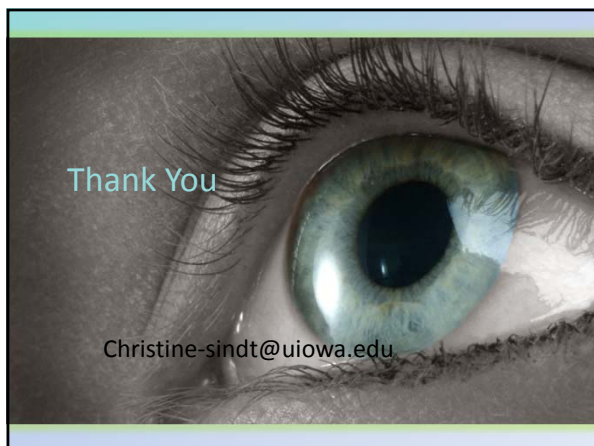



1. The patient on the left is a 68-year-old woman who vacations frequently in South Florida, where she is an avid golfer and boater. She has noticed the lesion on her left upper lid developing over the last year. Upon inspection, you find similar, smaller lesions on her hands, scalp and ears. What is the LEAST likely presumptive diagnosis?
  - a. Actinic keratosis
  - b. Basal cell carcinoma
  - c. Sebaceous cell carcinoma
  - d. Seborrheic keratosis

### Differential Dx

1. The patient on the right is an 88-year-old white female who lives in the mid-western United States. She has advanced Alzheimer's disease and cannot give an accurate history. A family member claims that the "bruise" on her upper lid was noticed about 2 weeks ago without any known trauma. Which of the following is NOT a red flag for potential malignancy?
  - a. Associated madarosis
  - b. Non-uniform color and shape
  - c. Location on the upper eyelid
  - d. A satellite lesion at the outer canthus



Thank You

Christine-sindt@uiowa.edu